collimator angle. The results are based on the value of GAI: when the value is lower than 95%, the error is detected. Introduced errors are smaller and smaller in order to characterize error detection limits of each method.
For Portal Dosimetry, it is possible to detect errors of collimator angle up to 4° and errors of Monitor Units up to 3%. For Delta4, it is possible to detect errors of collimator angle up to 2° and errors of Monitor Units up to 2 %. For Epiqa, it is possible to detect errors of collimator angle up to 2° and errors of Monitor Units up to 3%.

Conclusion: In spite of their differences, the three pre-treatment verification methods are able to detect different sort of errors in dose distributions. The comparative study gives us concordant results. Therefore, these data suggest the possibility of using only one routinely and complete the analysis with one of the other in case of problems.

EP-1522
Evaluation of usefulness of patient dose analysis system using MLC log file
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Purpose or Objective: In this study, we compared patient therapy planning evaluation system, applying MLC log file, with quality assurance system using the fluence map obtained from measurement, in order to assess usefulness of patient dose analysis system.

Material and Methods: To map out IMRT treatment planning, we used 4 targets and organ contours (multiple targets, virtual prostate, virtual head & neck, C type), along with IMRT phantom as presented in AAPM TG-119 Report. The treatment planning was implemented via Eclipse treatment planning system using 7 radiation field at an interval of 50º from 0o for both multiple targets and virtual prostate on one hand and using 9 radiation fields at an interval of 40º from 0o for both virtual head & neck and C type on the other hand. For dose limitation conditions for PTV and critical structure, we adopted the objectives specified in TG 119 Report. In relation to dose evaluation, point dose was evaluated by using CC13 chamber. The gamma index was analyzed for allowable limit of 3%/3mm by using MobiusFx system, a dose analysis software using MLC log file, in tandem with 2D array detector and Compass software that evaluates dose based on fluence map.

Results: Dose distribution was calculated using treatment planning and Mobius system for 4 targets and then compared through three-dimensional gamma index based on the setting criteria for allowable limit of 3%/3mm. The results showed the pass rate of 99.5% in multiple targets, 100.0% in prostate, 99.5% in head & neck, and 99.8% in C type. Based on results of analysis of gamma index for dose distribution, which was performed on the basis of dose distribution calculated by MobiusFX system and MLC log file actually investigated, the pass rate was found to be 100.0% in multiple targets, 100.0% in prostate, 99.7% in head & neck, and 99.5% in C type. Meanwhile, gamma index was analyzed based on dose distribution under treatment planning for 4 targets and dose distribution measured through Compass system, and the results indicated that the pass rate was 99.9% in multiple targets, 99.6% in prostate, 99.2% in head & neck, and 98.8% in C type. In addition, the results of point dose evaluation, performed based on point dose under treatment planning using CC13 chamber and point dose actually measured, showed that difference in pass rate was 1.2% in multiple targets, 1.5% in prostate, 1.3% in head & neck, and 0.4% in C TYPE.

Conclusion: This study may provide useful basis for ensuring quality assurance for each patient by using the MLC log analysis system during special treatments in clinical applications.

EP-1523
Validation of the dosimetric algorithm Acuros XB and the impact of its usage in SBRT treatments
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Purpose or Objective: The aim of this study was to assess the accuracy of the dosimertic algorithm based on the resolution of Boltzmann equation: “Acuros XB” (AXB) implemented in Eclipse (Varian) TPS. The methodology recommended by the IAEA-TECDOC-1583 was followed to evaluate AXB. AXB was also tested for clinical extra cranial stereotactic treatment cases. Moreover AXB with the two absorbed dose reporting options, dose-to-medium (Dm) and dose-to-water (Dw), was compared against the Analytical Anisotropic Algorithm (AAA).

Material and Methods: The IAEA-TECDOC-1583 presents eight different fields configurations in heterogeneous media. All plans were created on a CIRS thorax phantom model 002LFC including different tissue equivalent inserts (water, bone and lung). Measurements were performed with a PinPoint ionization chamber (type 31016, PTW) on Novalis TrueBeam STx accelerator for 6MV and 10MV photons with and without flattening filter (6FF, 6FFF, 10FF, 10FFF). Furthermore, target absorbed dose difference between AXB (Dm and Dw) and AAA were compared using same monitor units for 17 patients with non-small-cell lung cancer (NSCLC) or bone metastases cancer who underwent SBRT.

Results: AXB Dm calculations showed an excellent agreement with measurements for the eight configurations of the IAEA-TECDOC-1583. All the results fulfilled the agreement criterion given in the IAEA-TECDOC-1583. The biggest difference between measured and calculated absorbed dose with AXB (Dm and Dw) in lung was less than 0.6% for all photon energies. Unlike, in the lung region, AAA showed deviations that didn’t met the agreement criterion. Maximum deviations were 4.4%, 3.35%, 2.27% and 1.6% for respectively 6FF, 10FF, 6FFF and 10FFF photon energies. Although the Dm and Dw was almost the same in most tissues for all the energies, comparing them in bony structure didn’t give similar results. When choosing Dw in the bone region some results didn’t fulfilled the agreement criterion, unlike Dm where excellent agreement were found between calculated and measured absorbed dose. For the planning target volume (PTV) in the NSCLC patients, AXB Dm and Dw calculations showed similar results while compared to the AAA calculations, where the average differences were less than 2% for minimum, mean and maximum absorbed doses. For bone metastases cancer patients, comparing the PTV doses between AXB Dm and AXB Dw didn’t show similar results. The averaged deviations between AXB Dm and AAA were 1.7%, 0.1% and 2.2% whereas deviations between AXB Dw and AAA were 0.1%, 4.2% and 0.7%, respectively for minimum, maximum and mean absorbed doses.

Conclusion: The results of the IAEA-TECDOC-1583 and of clinical cases showed that the AXB algorithm is more accurate than AAA in the lung region for 6FF, 10FF, 6FFF and 10FFF photons. As for bone metastasis the use of AXB Dm was recommended.

EP-1524
The effect of the table top modeling on calculations and measurements for the Delta4 phantom
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Purpose or Objective: The purpose of this study was to investigate the effect of the modeling of the treatment table top on the agreement between calculations and measurements on the Delta4 phantom (Scandidos). Also, the effect of the most suitable way to determine the daily correction factor was investigated.

Material and Methods: Two of our linear accelerators are equipped with the standard Elekta iBeam evo carbon fiber table top. In our treatment planning system, Pinnacle v9.0 (Philips), the table top is modeled as a slab with dimensions equal to the width and height of the table top and with a density of 0.25 g/cm^3.
We extended the axial dimensions of the artificial CT-image set of the Delta4 phantom provided by Scandidos from 25 x 25 cm^2 to 50 x 50 cm^2 by a home-made program written in java. This allows us to place the table top model below the phantom at the real distance, ie 7 cm. 15 IMRT plans for breast cancer were recalculated twice, once on the CT-images of the Delta4 phantom provided by Scandidos and a second time on the extended CT-images with the table top model included. All plans consist of 5 to 6 beams (87 in total) from which 1 to 2 beams go through the table (23 in total). The plans were exported to the Delta4 software and measured. In case no table top model was included in the calculations, a daily correction factor based on the average of 4 beams (gantry angles of 0°, 90°, 180° and 270°) was applied. When the table top model was included, a daily correction factor based on 1 beam (gantry angle of 0°) was applied. A gamma criterion of 3%/3mm was used. Statistical analysis was done by paired t-tests. A p-value < 0.05 was considered as statistically significant.

Results: Without the use of daily correction factors, the mean pass rate for the overall treatment plans was respectively 90.7% (±6.9 SD) and 95.2% (±3.0 SD) without and with the table top model applied. This difference is significant with p = 0.01. In the first group 4 out of 15 pass rates were > 95%, whereas in the second group this is 9 out of 15. With the use of the proper daily correction factors, this increases to respectively 98.6% (±1.2 SD) and 99.1% (±0.9 SD). This difference is also significant with p = 0.04. In both groups, all pass rates were > 95%.
For individual beams going through the table top, the mean pass rate was respectively 90.8% (±9.9 SD) and 99.0% (±1.9 SD) without and with the table top model applied and without the use of daily correction factors (p = 0.0001). In the first group 10 out of 23 pass rates were > 95%, whereas in the second group this is 22 out of 23. With the use of the proper daily correction factors, this increases to respectively 99.0% (±1.6 SD) and 99.9% (±0.4 SD) (p = 0.01). In the first group 22 out of 23 pass rates were > 95% and in the second group all pass rates were > 95%.

Conclusion: The table top modeling results in a better agreement between measurements and calculations, both for total plans and individual beams. This agreement improves when proper correction factors are applied.

EP-1525

Clinical results of an EPID-based in-vivo dosimetry for prostate cancer treated by VMAT

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Purpose or Objective: In-vivo dose verification is the last step of a quality assurance procedure to ensure that the dose delivered during treatment is in agreement with the prescribed one.This work reports the in-vivo dosimetry (IVD) results obtained by the SOFTDISO software (Best Medical Italy) during VMAT prostate cancer treatments.

Material and Methods: SOFTDISO is based on a method developed by a cooperation between INFN and UCSC. It reconstructs in quasi-real time (a few seconds at the end of the fraction therapy) (i) the dose at the isocenter (**Diso**) in the patient from the transit signal acquired by the EPID and (ii) the comparison between EPID images obtained during the fractions of the therapy. In particular for each beam and fraction, the R ratios between the dose reconstructed at the isocenter point, **Diso,** in single-arc (179-181°) VMAT plans for prostate targets and the dose calculated by the TPS, **Diso,TPS** (generally about 2 Gy for fraction) obtained by Oncentra Masterplan, were computed. The acceptance criteria was: 0.95≤R≤1.05. Moreover the γ-analysis (2%-2mm) between portal images supplied useful index about the beam delivery reproducibility with the Pγ<1>95% and γ mean<0.4. 15 patients with prostate cancer were treated with 6 MV photon beam delivered by an Elekta Synergy Agility (Elekta, Crawley). Our protocol required, for each patient, the IVD in the first three treatment sessions after a CBCT based set-up correction and the IVD test once weekly afterwards for the rest of the treatment course when the CBCT scan was not acquired.

Results: The IVD procedure supplied 105 tests and the average R was equal to 1.003 ± 0.028 (1SD), in a range between 0.949 and 1.058. The global R value for each single patient was well-within the 5% tolerance level. The γ-analysis between EPID images supplied Pγ<1≥97% in 80% of the tests. 20% of the tests supplied 93%≤P γ<1<95% due to small setup variations as verified by the CBCT required at the end of the fraction therapy.

Conclusion: The IVD results supported the protocol about the CBCT carried out in the first three treatment sessions of the VMAT prostate cancer treatment. The facility of the real time test supplied by SOFTDISO allows a CBCT scan requirement after the daily-fraction that supplies IVD off tolerance level. The authors intend to apply this procedure to estimate protocols about the use of the CBCT scans for other pathologies as the head-neck tumors where heavy dose variations due to morphological changes can occurs during the therapy.

EP-1526

SPAN STYLE *In vivo* dosimetry with n-type Isorad semiconductor diodes during pelvic treatment

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Purpose or Objective: The study was aimed to check radiotherapy treatment accuracy and definition of action levels during implementation of in vivo dosimetry for treatment pelvic cancer patients as a part of quality assurance program.

Material and Methods: Calibration and corrections factors for in vivo entrance dose measurements for n-type Isorad semiconductor diodes for photon energy of 15 MV were determined as per recommendations published by *European Society for Radiotherapy and Oncology* (ESTRO) Booklet No.5. The pelvic cancer patients for in vivo measurements have been divided into groups, according to radiation techique used, in order to investigate and detect the groups for which the uncertainty was larger or for which a systematic error occurred. Initial tolerance/action levels for all groups were set at level of 5 %.

Results: In this study, entrance dose measurements were performed for total 185 treatment fields, of 95 pelvic cancer patients over one year period. In 6 (6%) out of 95 patients, in vivo measurements exceeded the tolerances. The mean value and the standard deviation for different groups were: Rectum and gynecology (four field box): 0.6%±3.07%(1SD), Prostate (five fields with wedges): +1.0%±2.22%(1SD). All pelvic measurements: +0.77%±2.79%(1SD). Larger standard deviation was shown for four field box cases because two large errors were noticed. After the corrections, in vivo dosimetry was repeated in both cases and the results were within the